Envirothon – Soils – Term List

Parent Material
Loess
Alluvium
Colluvium
Glacial till
Residuum

Erosion Types
Sheet, Rill, Gully

Soil Forming Factors
Parent Material
Biota
Topography
Climate
Time

Wetland Requirements
Vegetation
Hydrology
Soils

Master Soil Horizons
O
A
E
B
C
R

Other Terms
Drainage class
Redoximorphic Features
Permeability/Infiltration
Leaching
Gleyed colors
Land capability class
pH
Cation Exchange Capacity
Soil delineation vs Mapunit

Know How To…
Calculate slope
Find a PLSS location on the map index and map sheets
Determine soil texture
Read a textural triangle
Relate soil color to drainage or parent material
Determine landform
Read Soil Survey tables

Texture Triangle:

Fine Earth Texture Classes (———)

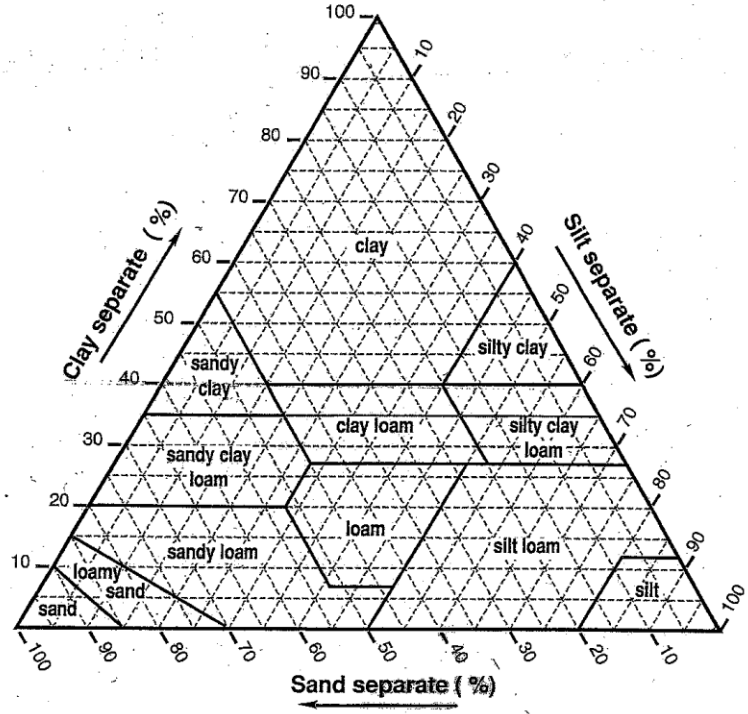


Figure 4.4 — Clues to the feel of textural classes

Clues to the Feel of Textural Classes

SAND

- Moist sample collapses after squeezing.
- Your hands don't get dirty working the sample.

LOAMY SAND

- Sample has very little body.
- Moist soil barely stays together after squeezing.
- Just enough silt and clay to dirty your hands.

SANDY LOAM

- Sand dominates noticeably.
- Enough silt and clay to give the sample body.
- Moist soil stays together after squeezing.
- Hardly forms any ribbon at all.

SANDY CLAY LOAM

- Feels gritty and sticky.
- Forms ribbon 1–2 inches (2.5–5 cm) long.

SANDY CLAY

- Feels definitely sandy.
- Forms ribbon 2–3 inches (5–7.5 cm) long.

LOAM

- Sand noticeably present, but doesn't dominate.
- Sample works easily between thumb and fingers.
- Contains enough silt and clay to give sample good body.
- Sample only forms short, broken ribbons.

SILT LOAM

- Feels smooth, like flour or corn starch.
- Tends to be nonsticky.
- Only forms short, broken ribbons.

CLAY LOAM

- Noticeably gritty, but sand doesn't dominate.
- Noticeably sticky.
- Noticeably hard to work between thumb and fingers.
- Forms ribbon 1–2.5 inches (2.5–6 cm long).

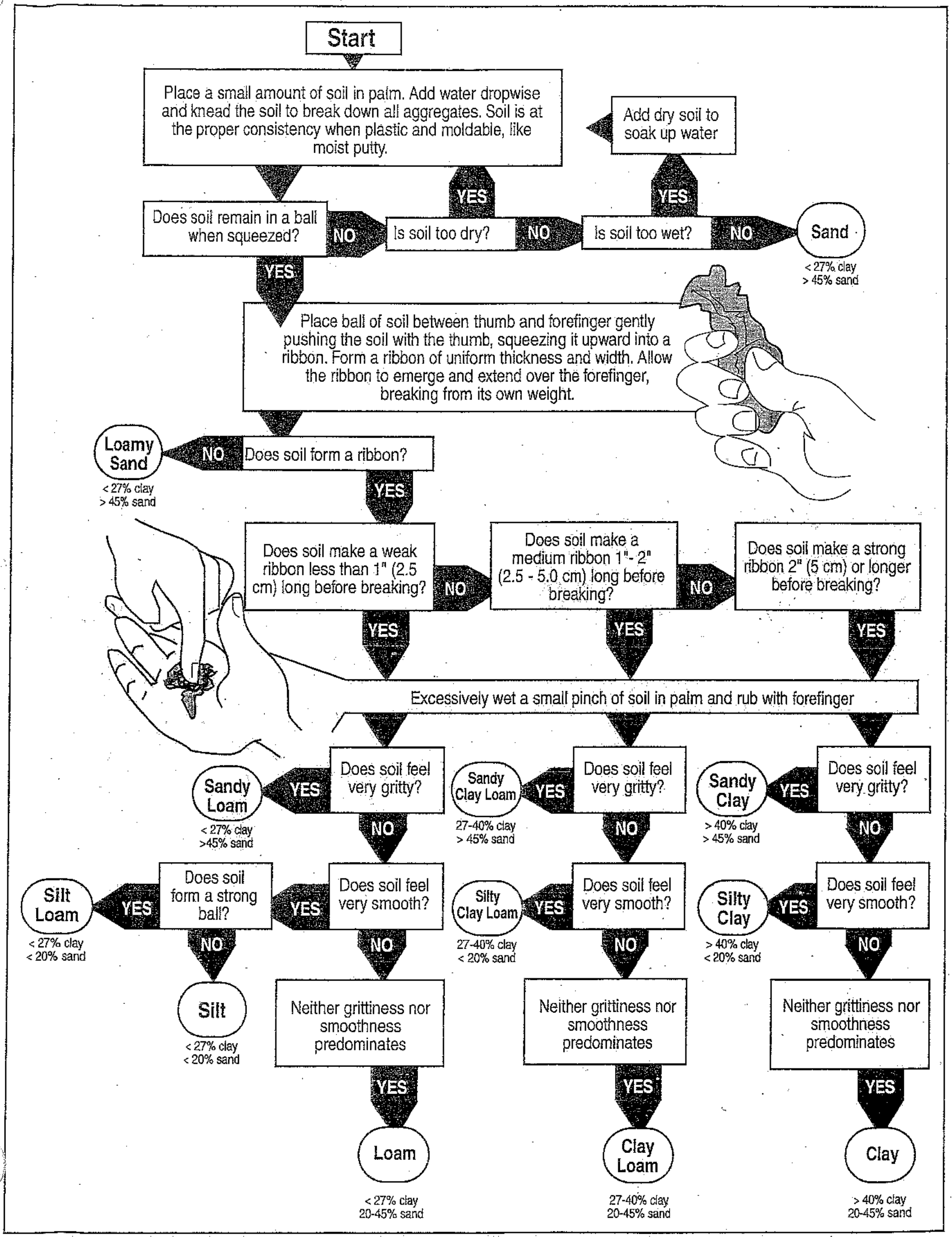
SILTY CLAY LOAM

- Feels smooth and sticky.
- Contains very little sand.
- Forms ribbon 1–2.5 inches (2.5–6 cm) long.

CLAY AND SILTY CLAY

- Dry sample absorbs a lot of water before it is moist enough to work.
- Sample very hard to work between thumb and finger.
- Forms ribbon 2.5–4 inches (6–10 cm) long.

Figure 4.6 — Flowchart for estimating textural classes

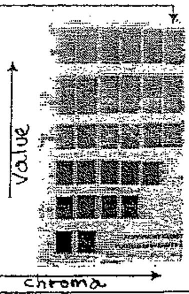


Munsell Color Chart

Hue: 10 YR

Value: Lightness or Darkness

Chroma: Intensity of Color



- HVC ...Harvey Values Colors ☺
- Always evaluate the color of the soil when it is moist.
- Hue – the dominant spectral color, wavelength of light reflected by soil particles
- Value – the lightness or darkness of the color, amount of light reflected
- Chroma – the strength or purity of color, degree of difference between white and black. Low numbers indicate an increase in grayness, while high numbers signify a pure color with little mixing with other hues.

10 total drops of food coloring represent the Hue
2.5YR = 2.5 drops of yellow food coloring : 7.5 drops of red
7.5YR = 7.5 drops of yellow : 2.5 drops of red
10YR = 10 drops of yellow : 0 drops of red
5Y = 5 drops of yellow : 0 drops of red

Landscapes and Drainage

Well Drained Eroded Soil

Moderately Well or Somewhat Poorly Drained Soil

Poorly Drained Soil

- Dark colors often = organic matter (OM), OM is made up of much elemental Carbon, elemental Carbon is black – like burnt toast, black (dark colors) = OM
- Red colors often = good drainage and aeration, Iron in the soil "rusts" similarly to Iron on metal when exposed to oxygen, rust is often red, red matrix/mottles = aeration
- Gray colors (low chroma, less than '2') often = poor drainage, Iron can not be "rusted" by the oxygen because water is filling the pores, the water in the pores makes it look kind of boggy and gray
- Seasonally wet horizons will have reddish mottles (precipitates iron oxide), and grayish depletions (iron oxide has been moved from this zone).
- Mineralogy of the parent material will also exhibit certain colors, especially obvious in the subsoil.

STRUCTURE

Granular

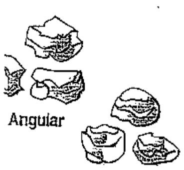
GRANULAR

Granular structure is roughly spherical, like Grape Nuts™ cereal. The structure is usually 1–10 mm in diameter. It is most common in surface horizons (A horizons) where plant roots, microorganisms, and sticky products of organic matter decomposition bind soil grains into aggregates.

Platy

PLATY

Platy structure consists of flat peds that lie horizontally in the soil. Most are less than 2 cm thick. Platy structure is not common, but occurs mostly in subsurface horizons or dense layers (E and Bx horizons).

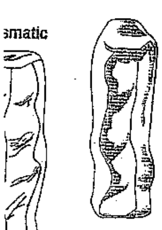


Angular

Subangular

BLOCKY

Blocky structure consists of peds that are roughly cube-shaped with generally flat surfaces. Blocky structures are divided into two types: **angular blocky** structure has edges and corners that remain sharp, whereas **subangular blocky** structure has edges and corners that are rounded. Sizes commonly range from 5 to 50 mm across. Blocky structures are typical in the subsoil (B and Bt horizons). They form by repeated expansion and contraction of clay materials.



smatic

Columnar

PRISMATIC

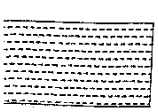
In prismatic structure, peds are taller than they are wide. They often have five sides. Sizes are commonly 10–100 mm across. Prismatic structure is most common in the lower part of the subsoil (B and BC horizons). The prisms in some strongly developed soils have rounded tops because the tops have lost their corners by eluviation (downward movement of material). These prisms are called **columnar.**

STRUCTURELESS

Single Grain

SINGLE GRAIN

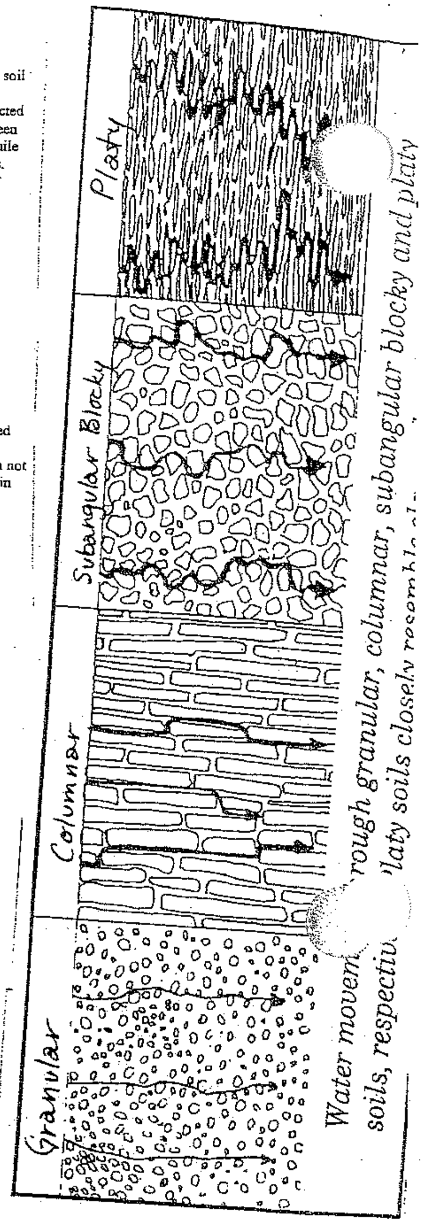
In some very sandy soils, every grain acts independently and there is no binding agent to hold the grains together into peds. Permeability is rapid, but fertility and available water capacity are low.



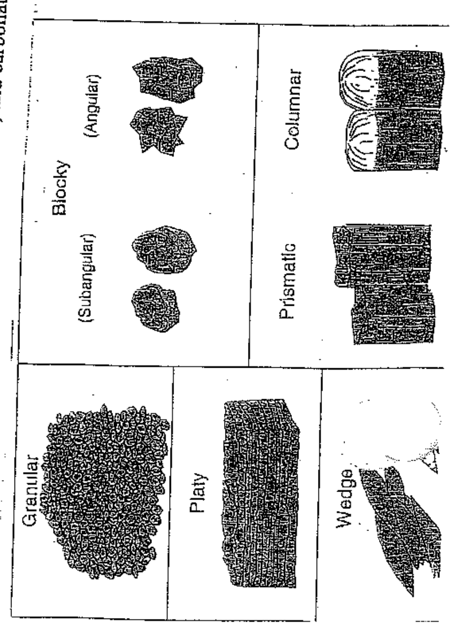
Massive

MASSIVE

Compact, coherent soil is not separated into peds of any kind. Massive, claylike soils usually have very small pores, slow permeability, and poor aeration.



Structure
Aggregation of particles - Shrink/swell, freeze/thaw, etc. brings particles close together - Organic matter forms a weak cementing agent (also silica, metal oxides, and carbonates) - Allows for water and soil particle movement



Soil Horizons

Soil horizons are named using combinations of letters and numbers. Six general kinds of horizons may occur in soil profiles. They are named with the capital letters O, A, E, B, C, and R. These are called **master horizons**. In Figure 6.1, each master horizon is shown in the relative position in which it occurs in a soil profile. All six master horizons are shown, even though a soil usually has only three or four horizons.

Gradual changes from one master horizon to another give rise to transitional horizons. These are named with two letters, for example, AB, BA, and BC. Subordinate divisions of master horizons are named by adding lower case letters, for example, Ap, Bt, and Cr. Thick horizons may be subdivided using Arabic humerals, such as A1 and A2, or Bw1, Bw2, and Bw3. Transitional horizons, subordinate divisions of master horizons, and subdivisions of thick horizons are discussed later in this chapter.

A single soil profile may never have all the horizons that are possible. Most Missouri soils have A, B, C, and one or two transitional horizons. Other Missouri soils may have an A horizon resting directly on a C or R horizon, or an A-E-B-C horizon sequence, or even an O-E-B-C horizon sequence. Originally, the letters A, B, and C were used to indicate the consecutive order of the horizons. Later, for more clarity, O, E, and R were added, O meaning "organic," E meaning "eluviation," and R meaning "bedrock."

Because all six master horizons occur somewhere in Missouri or the United States, it is important to know what each one is and how it differs from the others. Each master horizon has a distinct set of properties.

O Horizon

The O stands for "organic." O horizons do not have to be 100 percent organic-matter material. Forest soils usually have thin organic horizons at the surface. They consist of leaves and twigs in various stages of decay.

Wet soils in bogs or drained swamps often have O horizons of peat or muck. Very few soils in Missouri have O horizons of this kind. Most soils in Missouri have only thin O horizons, and these are usually forests. O horizons are destroyed by plowing and do not occur in cultivated areas.

A Horizon

humus accumulation loss of Fe, Al, clay

The A horizon is the surface horizon of a mineral soil. Its unique characteristic is a dark color formed by the addition of humus. (See Plates 2, 7, 10, 12, 13, pp. 50a, 50b, 50c, 50d*.) The A horizon is also typified by a granular or fine blocky structure (aggregate shape) and friable consistence (easily crushed).

The thickness of the A horizon ranges from a few inches in most forested soils to more than 30 inches in some upland prairie soils and some alluvial soils on flood plains. Every cultivated agricultural soil has an A horizon.

A horizons are extremely important in maintaining soil fertility and providing a favorable environment for root growth. They should be protected from erosion and compaction.

E Horizon

loss of Fe, Al, clay + organic matter

This horizon generally is grayish-brown to white in color. It is not present in all Missouri soils, but when it is, it occurs immediately beneath an O or an A horizon. (See Plates 11, 12, 13, pp. 50c, 50d*.) E horizons are light-colored because nearly all the iron and organic matter have been removed. One can think of the E as meaning "eluviation" or "leaching." (This horizon was formerly referred to as the A2 horizon.)

E horizons occur in most forested soils that have not been cultivated, and in several of the prairie soils in Missouri. In most soils, the E horizon has noticeably less clay than the B horizon beneath it.

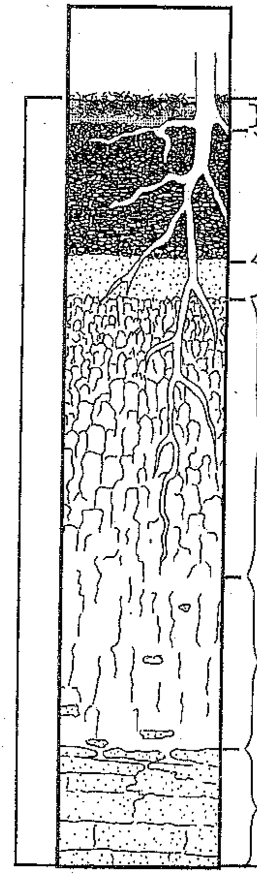
B Horizon

accumulation of clay, Fe, Al, humus; subsurface structure

The B horizon is the subsoil layer that generally changes the most because of soil-forming processes. Several kinds of changes are possible.

In some soils, the B horizon has bright yellowish-brown, reddish-brown, or red colors. (See Plates 5, 9, pp. 50b, 50c*.) In others, it has the most evident blocky or prismatic structure. (See Plate 6, p. 50b*.) (See Chapter 5, *Soil Structure*, for a detailed discussion on structure.) Many B horizons have more clay than other horizons, and clay films may be visible. Kinds of B horizons are discussed more fully in the section, "Subordinate Divisions of Master Horizons."

Figure 6.1 — Master horizons



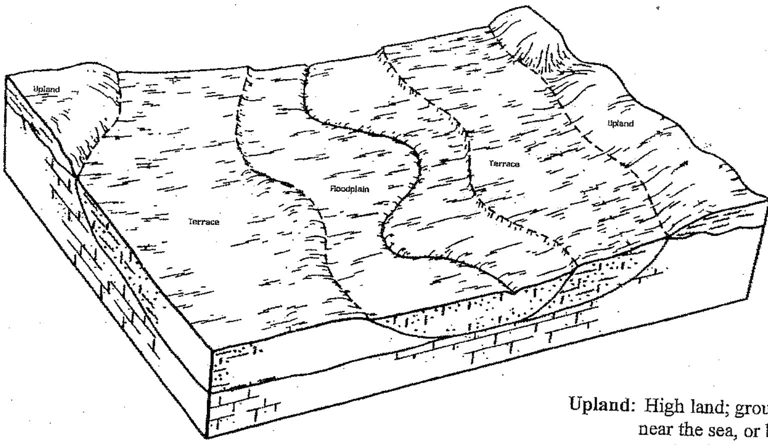
- O — **O Horizon** - Plant litter. Organic debris (leaves, etc.) in various stages of decay.
- A — **A Horizon** - Zone of eluviation. Zone of maximum humus accumulation (usually dark colored).
- E — **E Horizon** - Zone of eluviation. Zone of maximum eluviation (usually light colored).
- B — **B Horizon** - Zone of translocated clay.
- C — **C Horizon** - Weathered unconsolidated material.
- R — **R Horizon** - Bedrock.

C Horizon

The C horizon is weathered, unconsolidated geologic material below the A or B horizon. Anything that one can dig with a spade, which has not been changed very much by the soil forming processes, is considered C horizon. also soft bedrock

R Horizon

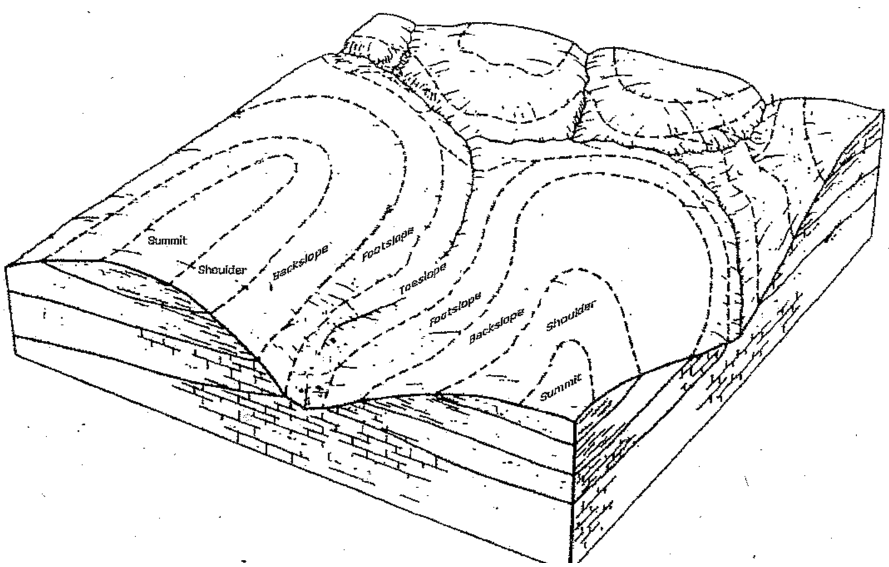
R stands for "bedrock." It refers to hard bedrock that one cannot easily dig with a spade. Depending on the depth to bedrock, the R horizon may occur directly beneath any of the other master horizons. (See Plate 1, p. 50a*.)

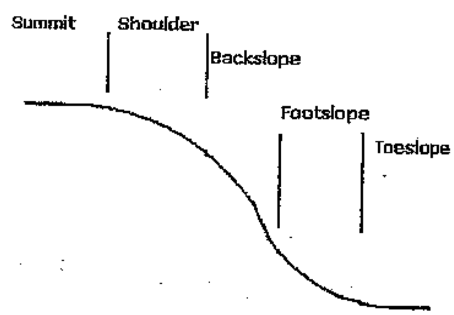


Upland: High land; ground elevated above the meadows and intervals which lie on the banks of rivers, near the sea, or between hills; land which is generally dry; -- opposed to lowland, meadow, marsh, swamp, interval, and the like.

Terrace: A step-like surface, bordering a stream or shoreline, that represents the former position of a floodplain, lake, or seashore.

Floodplain: The nearly level plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artifically. It is usually a constructional landform built of sediment deposited during overflow and lateral migration of the stream.





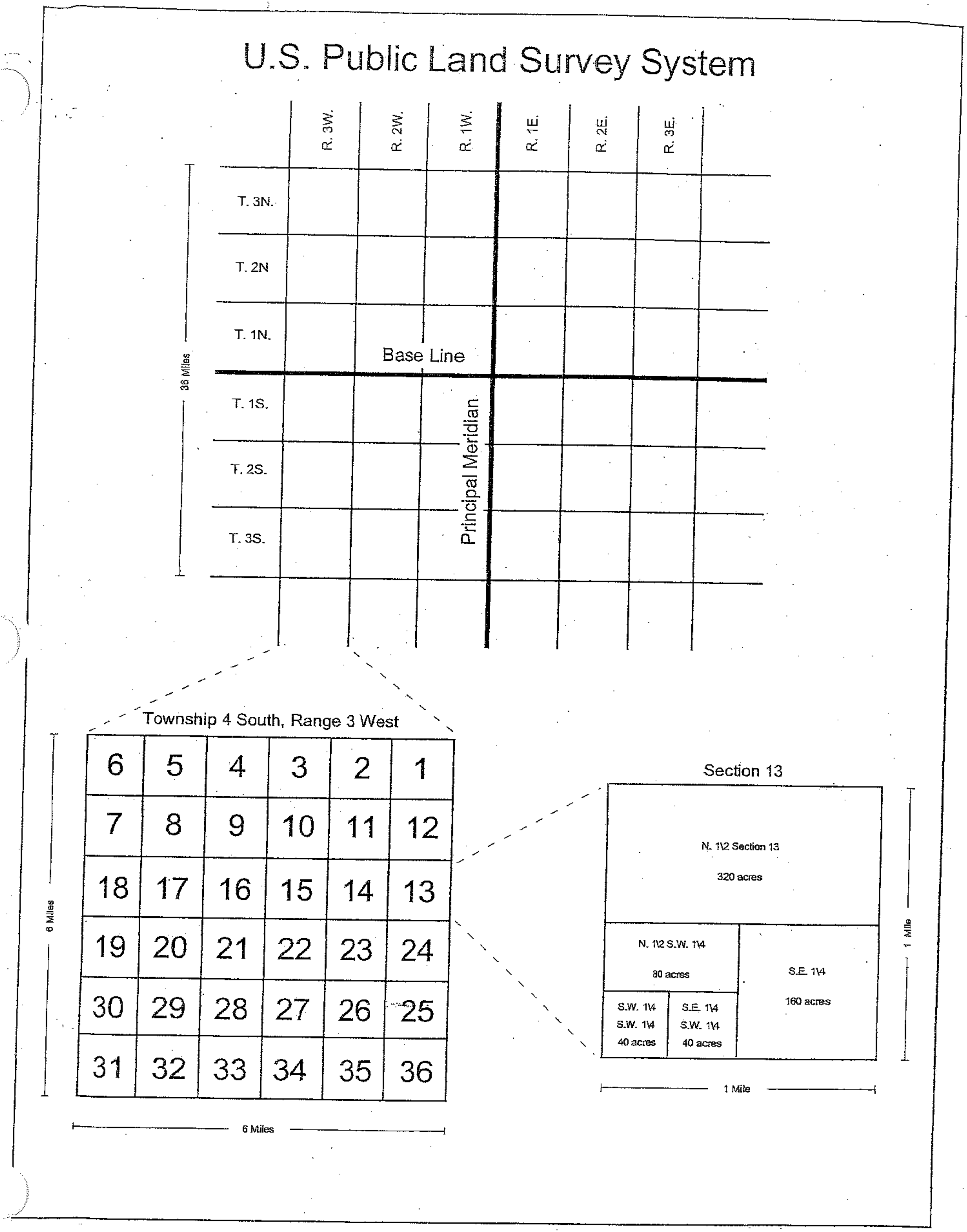
Summit: The highest point of any landform remanant, hill, or mountain..

Shoulder: The hillslope position that forms the uppermost inclined surface near the top of a slope. If present, it comprises the transition zone from backslope to summit. This position is dominantly convex in profile and erosional in origin.

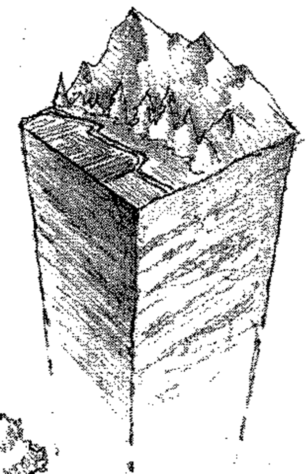
Backslope: The hillslope position that forms the steepest, and generally linear, middle portion of the slope. In profile, backslopes are bounded by a convex shoulder above and a concave footslope below.

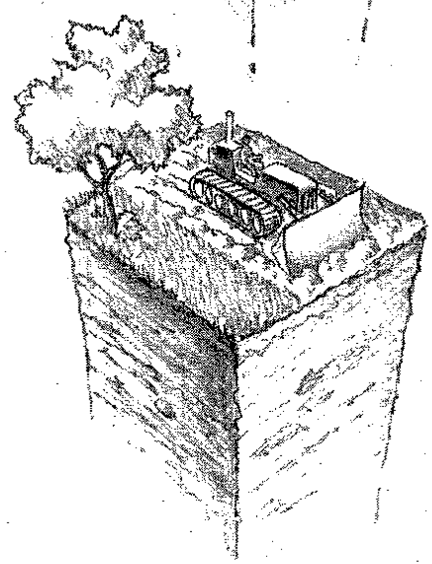
Footslope: The hillslope position that forms the inner, gently inclined surface at the base of a slope. In profile, footslopes are commonly concave and are situated between the backslope and a toeslope.

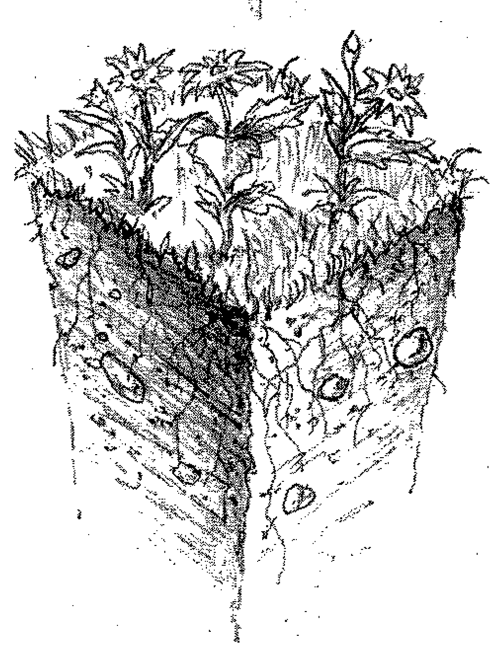
Toeslope: The hillslope position that forms a gently inclined surface at the base of a slope. Toeslopes in profile are commonly gentle and linear, and are constructional surfaces forming the lower part of a slope continuum that grades to a valley or closed depression.


U.S. Public Land Survey System
R. 3W.
R. 2W.
R. 1W.
R. 1E.
R. 2E.
R. 3E.
T. 3N.
T. 2N
T. 1N.
Base Line
T. 1S.
T. 2S.
T. 3S.
Principal Meridian
36 Miles
Township 4 South, Range 3 West
6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36
6 Miles
Section 13
N. 1\2 Section 13
320 acres
N. 1\2 S.W. 1\4
80 acres
S.E. 1\4
160 acres
S.W. 1\4
S.W. 1\4
40 acres
S.E. 1\4
S.W. 1\4
40 acres
1 Mile

SOILS/LAND USE KEY POINTS







Students should be able to:

- Recognize soil as an important and dynamic resource.
- Recognize and understand the features of a soil profile.
- Describe basic soil properties and soil formation factors.
- Understand the origin of soil parent materials.
- Identify soil constituents (e.g., clay, organic matter, sand and silt).
- Identify and list soil characteristics (e.g., texture, structure, etc.) and their relation to soil properties.
- Determine basic soil properties and limitations (e.g., mottling and permeability) by observing a soil pit or a soil profile.
- Understand the nature of plant nutrients and how they are held by soil.
- Recognize the characteristics of wetland (hydric) soils.
- Understand soil drainage classes and know how wetlands are defined.
- Understand soil water, its movement, storage, and uptake by plants.
- Understand the effects of land use on soils.
- In land use planning discussions, discuss how soil is a factor in or is impacted by non-point source pollution.
- Identify types of soil erosion and discuss methods for reducing erosion.
- Utilize soil information, including a soil survey.

Canon ENVIROTHON

For more information about the Canon Envirothon, please visit us on the web at **www.envirothon.org**